Oct. 12, 1943. J. J. JANOSKA 2,331,474

ROCK DRILL

Filed Feb. 16, 1942

FIG. 1

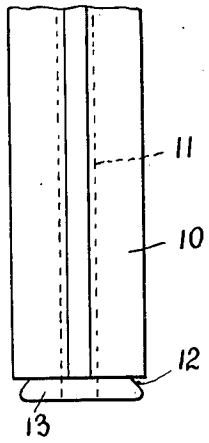


FIG. 2

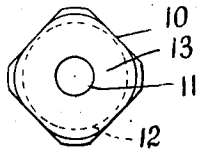


FIG. 3

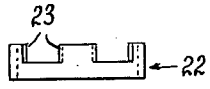


FIG. 4

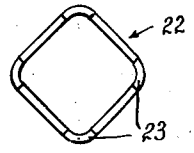


FIG. 5

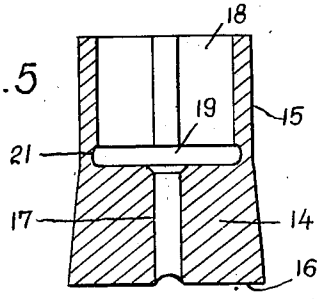


FIG. 6

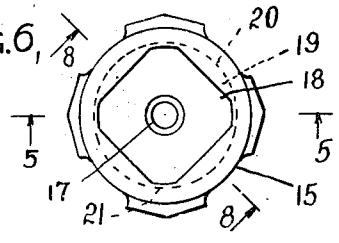


FIG. 7

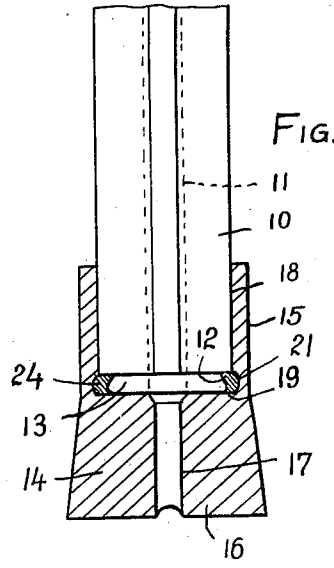
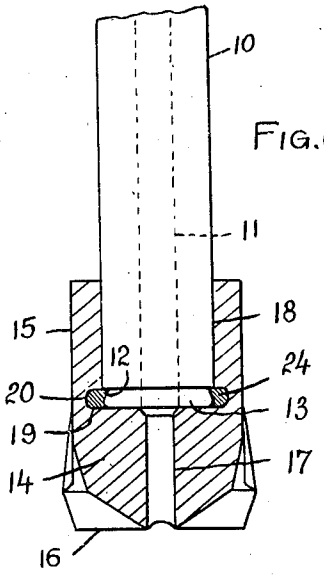


FIG. 8



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Patented Oct. 12, 1943

2,331,474

UNITED STATES PATENT OFFICE

2,331,474

ROCK DRILL

John J. Janoska, Anaconda, Mont.

Application February 16, 1942, Serial No. 431,012

3 Claims. (Cl. 287—119)

This invention relates to rock bits, and has for its principal object to provide an improved rock bit assembly comprising a rock bit detachably but firmly secured to a drill rod. The invention further provides an improved form of rock bit and an improved form of drill rod for use in the new assembly.

For many years rock drills were made with the bit formed integrally with a long drill rod. This type of drill was extremely inconvenient to use, because to sharpen it, as was necessary at frequent intervals, the entire heavy drill rod had to be carried to the sharpening shop. Moreover, it was uneconomical in large mining operations because of the large amount of steel tied up in idle drill rods awaiting sharpening of the bit, and the necessity of discarding the entire drill rod when the bit was worn out.

In recent years detachable bits have largely replaced the old integral bit and drill rod. The detachable bit is detachably secured to the drill rod, so that it may be removed for sharpening and a new bit may be substituted in its place. The heavy drill rod may be kept at the scene of drilling operations and may be kept in more or less continuous use.

Many different proposals have been advanced for detachably securing the bit to the drill rod. The problem, however, is not a simple one, because the joint must be such that it is not damaged by the repeated heavy hammer blows to which the drill rod and bit must be subjected in use, and it must be of such design that the bit and drill rod may be rotated during drilling operations without causing the joint to jam. In addition, the joint often must be water-tight because of the common practice of injecting water or other drilling fluid under pressure through an axial passage in the drill rod and bit to wash out cuttings formed in the course of drilling.

Threaded joints between the bit and the drill rod have been quite widely used, although this type of joint is subject to some disadvantages. For example, there must be considerable thickness of the metal at the shank portion of the bit so as to permit forming the threads without weakening the bit. Further, the threads must be carefully designed so as to be tight and firm, and yet not be damaged by the hammer blows to which the joint is subjected in hard rock drilling. Except where the threads on both drill rod and bit are virtually perfectly mated, the joint is likely to be loose, or else the threads themselves take a considerable part of the punishing hammering incident to drilling.

Compression joints made by forcing a tapered shank formed on the drill rod into a tapered recess in a bit have also been proposed, but have been less successful than threaded joints. The repeated hammering to which the joint is subjected in use causes the metal of the bit shank to be wedged out and weakened, or, if the end of the drill rod bears against the bottom of the recess in the bit, the hammering causes the joint to loosen.

The present invention provides an improved rock bit assembly of detachable bit and drill rod, in which the joint is of a novel design such that its strength for drilling purposes is equal to the best threaded joints, but such that it may be made with a substantially smaller cross section of metal in the drill rod and bit shank. The joint does not require carefully and accurately formed threads and does not involve the use of tapered shanks and recesses, and so is free from the objections inherent in these types of joints.

In accordance with the invention, the bit, comprising a bit portion and a shank portion, is formed with a non-circular recess having substantially straight sides in the shank portion. In addition, a groove is formed in the shank portion peripherally and interiorly of the recess, preferably at the bottom thereof. The end portion of the drill rod is of non-circular cross section, substantially conforming in size and shape to the recess in the bit. A peripheral groove is formed in this end portion of the drill rod, preferably substantially at the end thereof. In the assembly of bit and drill rod, the end portion of the drill rod extends into the recess formed in the bit, with the end of the drill rod bearing against the metal of the bit at the bottom of the recess, and with the grooves in the drill rod and bit substantially in alignment. A soft metallic filling is tightly compressed between the bit and the drill rod and extends into both of the grooves, thus securely locking the bit to the drill rod. Although the recess is preferably formed in the bit, it is of course obvious that the recess may instead be formed in the drill rod, and the corresponding end portion for insertion into the recess may be formed on the bit shank.

The invention will be better understood from the following description of a specific embodiment, considered in conjunction with the accompanying drawing, in which

Fig. 1 is an elevation of the end portion of a drill rod made according to the invention;

Fig. 2 is an end view of the drill rod shown in Fig. 1;

Fig. 3 is an elevation of a soft metal insert;

Fig. 4 is a plan of the soft metal insert;

Fig. 5 is a cross section through the new bit, taken substantially along the line 5—5 of Fig. 6;

Fig. 6 is an end view looking down on the bit shown in section in Fig. 5;

Fig. 7 shows the assembly of bit and drill rod, the bit being shown in section taken substantially along the line 5—5 of Fig. 6; and

Fig. 8 is a view of the assembly shown in Fig. 7 but with the parts rotated 45°, the bit being shown in section taken substantally along the line 8—8 of Fig. 6.

As shown in the drawing (particularly Fig. 2), the cross-sectional shape of the end portion 10 of the drill rod is substantially square but with the edges beveled. It is understood, however, that other non-circular cross-sectional shapes may be employed. The drill rod is formed with an axial passage 11 to permit water or other drilling fluid to be introduced into the hole being drilled. A peripheral groove 12 is formed at the end of the drill rod, advantageously by turning so as to form an integral button 13 at the end of the drill rod. The groove 12 extends around the entire periphery of the end of the drill rod.

The bit (Fig. 5) comprises a bit portion 14 and a shank portion 15. The bit portion 14 is formed with the usual cutting edges 16, and is provided with an axial opening 17 for the passage of water or other drilling fluid introduced through the corresponding axial opening 11 in the drill rod. A recess 18 is formed in the shank portion 15 of the bit. The cross-sectional shape of this recess 18 corresponds to the cross-sectional shape of the end portion 10 of the drill rod, and is of such size as to permit the drill rod to be inserted easily, but without the fit being particularly loose. The vertical (as shown in the drawing) sides of the recess 18 are substantially straight and untapered. A peripheral groove 19 is formed (advantageously by turning) in the bit shank interiorly of the recess 18 and advantageously at the bottom thereof and extends into but not through any portion of the wall surrounding the recess. If formed by turning, this groove will be deepest in the center of the sides of the squared recess 18 (as indicated at 20 in Fig. 6) and may be very shallow at the beveled corners of the recess (as indicated at 21 in Fig. 6).

The bit is secured to the drill rod by means of a soft metal insert tightly compressed between the drill rod and the bit and extending into the grooves 12 and 19, respectively. A form of soft metal insert 22 suitable for this purpose is shown in Figs. 3 and 4. This insert comprises essentially a washer of soft metal of such size and squared shape as to fit snugly into the recess 18 about its periphery. Upstanding lugs 23 may be formed on the insert to provide metal to flow into the deeper parts of the grooves 12 and 19. For convenience of manufacture, the insert may be cut from sheet metal stock and bent to the desired shape. Any soft metal capable of flowing under high pressure may be employed for making the insert 22. Lead, tin and various lead and tin alloys are particularly satisfactory metals for this purpose, although other soft metals may be employed if desired.

In securing the bit to the drill rod, the insert 22 is first placed in the recess 18 in the bit shank, preferably with the lugs 23 pointing up. The end portion 10 of the drill rod is then inserted into the recess 18, and the bit and drill rod are pressed together under sufficiently high pressure so that the soft metal insert is deformed and caused to flow into the groove 19 at the bottom of the recess 18 of the bit and into the groove 12 formed at the end of the drill rod, thereby securely locking the two parts together.

The assembled drill rod and bit are shown in Figs. 7 and 8. In the assembly the end portion 10 of the drill rod extends into the recess formed in the shank portion 15 of the bit so that the groove 12 at the end of the drill rod is substantially aligned with the groove 19 formed in the bit shank at the base of the recess 18. The soft metal insert has been compressed and caused to flow into these two grooves, forming a tightly compressed soft metal filling 24 extending into and completely filling both of these grooves and securely locking the drill rod and bit together. The tightly compressed soft metal filling 24 also forms a water-tight joint between the drill rod and bit, so that water or other drilling fluid may be passed under pressure through the axial openings 11 and 17 in the drill rod and bit, respectively, into the hole being drilled to wash out cuttings.

Owing to the non-circular cross-sectional shape of the end portion 10 of the drill rod and of the recess 18 into which it fits, the bit may be turned during drilling by rotating the drill rod without imposing sufficient strain on the soft metal filling to weaken the joint between the bit and drill rod, and without causing the joint to leak. Since the end of the drill rod bears directly against the bit at the bottom of the recess 18 therein, the hammer blows incident to drilling are transmittted directly from the drill rod directly to the bit, without imposing appreciable strain either on the soft metal filling or on the relatively thin metal section of the shank 15 of the bit. In fact, this hammering has the effect of maintaining the soft metal tightly compressed between the drill rod and bit so that the joint is maintained tight during drilling operations.

Since there is no significant strain applied to the shank portion 15 of the bit, this portion may be thinner and lighter than has heretofore been possible.

The bit may be detached from the drill rod quite readily by pulling them apart with sufficient force. The soft metal filling 21 ruptures or pulls out of the grooves 12 or 19 fairly easily. Any of the soft metal filling remaining in either of the grooves 12 and 19, after detaching the bit from the drill rod, may be pried out without particular difficulty, rendering the two parts ready to be joined together again, or to other mating parts, by means of a new soft metal insert.

I claim:

1. A rock bit assembly comprising a rock bit having a non-circular recess formed therein and further having a peripheral groove adjacent the bottom of the recess extending into but not through any portion of the wall of the bit surrounding the recess, a drill rod having its end portion extending into said recess, said end portion of the drill rod substantially conforming in cross section to the non-circular shape of said recess and being provided with a groove substantially aligned with the groove formed in the bit within said recess, and a soft metal forced under pressure into both of said grooves, substantially filling them and locking the bit securely to the drill rod.

2. A rock bit assembly comprising a rock bit having a substantially axial opening there-

through and a non-circular recess formed in the shank portion thereof and further having a peripheral groove adjacent the bottom of the recess extending into but not through the wall surrounding the recess, a drill rod having a substantially axial opening therethrough and having its end portion extending into said recess, said end portion of the drill rod conforming in cross section approximately to the non-circular shape of said recess and being provided with a groove substantially aligned with the groove formed in the bit within said recess, and a ring of soft metal forced under pressure into and substantially filling both of said grooves and locking the bit securely to the drill rod and forming a liquid-tight joint between the bit and drill rod.

3. A rock bit assembly comprising a bit and a drill rod, one of said parts being formed with a non-circular recess and the other of said parts having a corresponding non-circular end portion extending into said recess, the one of said parts having a peripheral groove adjacent the bottom of the recess extending into but not through the wall surrounding the recess and the other of said parts having a groove formed about the periphery of said end portion and substantially aligned with the first-mentioned groove, and a ring of soft metal forced under pressure into both of said grooves and locking the bit securely to the drill rod.

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